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Diversity and conservation status of avifauna in western Navsari, South Gujarat - 10 years of observations

Minal Patel¹, Priyank Kapdi², Neel Tandel³, Jay Desai⁴, Zankhna Patel⁵

ABSTRACT

We present a checklist of bird species observed during the period of ten years (2010-2020) in the Western Navsari, South Gujarat, which is characterized by wetlands, scrublands, and agroecosystems. We observed a total of 277 bird species with one subspecies belonging to 20 orders, 72 families and 175 genera. Of the recorded species, 158 bird spp. are resident, 95 bird spp. winter migrant, 8 bird spp. resident as well as winter migrant and four bird spp. passage migrant. According to the IUCN red list, two species are endangered, seven vulnerable, and 12 near-threatened in the study area. This study represents the long-term species occurrence trend of avian diversity in unprotected areas that are constantly subjected to human interference, but still support a diverse array of flora and fauna. In this communication, we also briefly describe some noteworthy sightings along with a few first records in the study region and provide baseline data for future research of avifauna which can help in bird conservation.

Keywords: Birds, Biodiversity, Unprotected areas, Urban wildlife

1. INTRODUCTION

The avian diversity of an area plays crucial ecological roles, mainly in pollination, seed dispersal, and pest control (Sekercioglu et al. 2016; Jha, 2021). The avian diversity is known to indicate the health of the ecosystem as they act as bio indicators (Egwumah 2017; Zhang & Ma 2011). Maintaining the record of the species diversity in an area is a prerequisite for any research study and conservation planning. In Gujarat, the different habitat types ranging from salt desert, thorn forests to dry and moist deciduous forests along with numerous inland and coastal wetlands harbor diverse species of resident and migratory birds. Gujarat's avifauna has been seeking the attention of many naturalists and scientists. As a result, its avifauna has been keenly observed and documented since historic times (see Pittie 2010). Ali (1954 - 1955) studied the birds of Gujarat extensively from 1942 to 1949. The

major part of Saurashtra has been covered in detail by Dharmakumarsinhji (1955). The recent checklist of Gujarat records 612 bird species (Ganpule 2021). It is a subsequent update of the checklist by Parasharya et al. (2004) and Ganpule (2016, 2017, 2020a & 2020b). The region of Kutch and Saurashtra have gained ample attention in terms of published literature. However, the areas of the eastern and southern parts are seldom reported in the literature.

South Gujarat has a considerable cover of dry deciduous and moist deciduous forest cover in the state. Also, the area of inland and coastal wetlands supports considerable diversity of birds. Apart from natural ecosystems, Southern Gujarat has a noticeable cover of agroecosystems, covering agricultural and agroforestry lands. Agroecosystems have been reported to host a diversity of birds and provide nesting sites as well. (Borad et al. 2000, 2001). The whole of South Gujarat has been considered as one unit in most of the previous literature (Ali 1954-1955; Parasharya et al. 2004; Ganpule 2016, 2017, 2020 & 2021). The detailed information about different parts of south Gujarat is lacking. The studies focusing on South Gujarat date back to the 1960s by Shull (1962a, 1962b, 1964 & 1967), focused on select areas of Surat-Dangs (Ahwa-Dangs was popularly known as Surat-Dangs then). Shull (1964) has recorded a total of 290 species of birds in Surat-Dangs. Worah (1991) studied the avifauna of Purna Wildlife Sanctuary and Vansda National Park. Trivedi and Soni (2006) have studied the bird diversity of Purna and Ratanmahal Wildlife Sanctuaries. Birds of Shoolpaneshwar Wildlife Sanctuary have been studied by multiple authors (Monga et al. 1984; Desai et al. 1993; Narve et al. 1997). The recent literature by Jambu and Patel (2021) recorded 297 species of birds from the Surat-Dangs area, which majorly focuses on the Purna Wildlife Sanctuary and Vansda National Park. Whilst the protected areas have got ample attention in the studies and published literature, the unprotected areas lack any studies. Thereby this study mainly focuses on the unprotected areas of the western part of the Navsari district (fig 1). Which is characterised by habitats namely coastal wetlands, inland wetlands, scrublands, and agroecosystems. This study presents about 10 years of observation of diversity bird species of Navsari outskirts with their residential status, IUCN status, WPA status and feeding guilds.

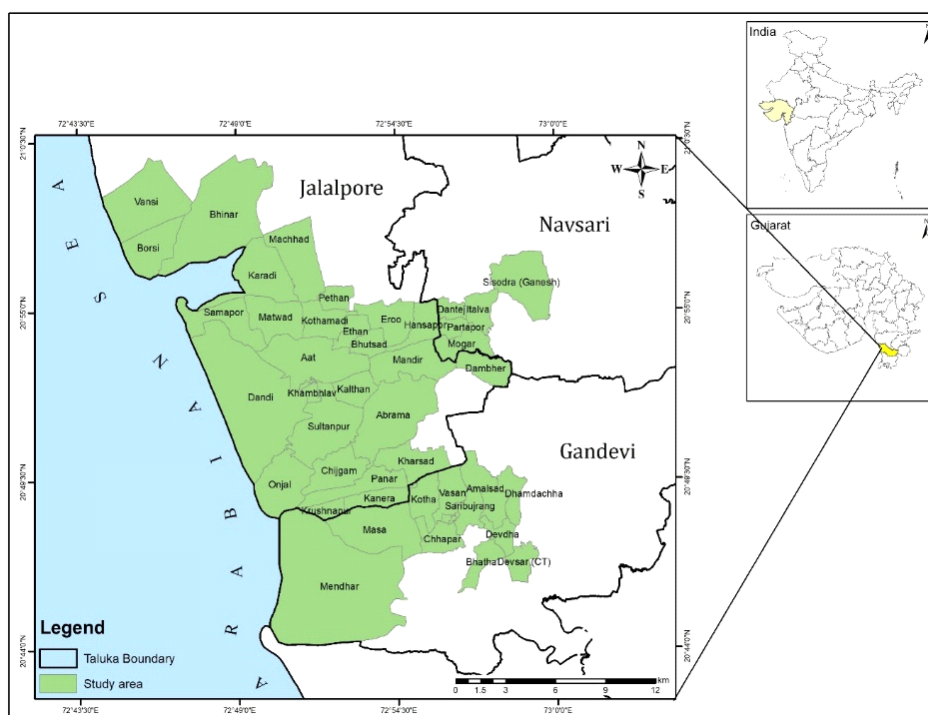


Figure 1: Map of study area (Western Navsari). Area highlighted in green colour indicates focal study sites.

2. MATERIALS AND METHODS

Study area

Navsari (20.946 N, 72.952 E) is situated in southern Gujarat and near the Purna River, within a few kilometres of the river's delta, which is west of the city and empties into the Gulf of Khambhat. It has an average elevation of 9 m above sea level, typically humid and warm monsoon with rainfall of about 1500 mm, moderately cold winter and fairly hot and humid summer with an average annual temperature of 27.1 C° and belongs to AES-III, South Gujarat Heavy Rainfall zone (<https://navsari.nic.in/about-district/>).

Navsari district has a cover of moist deciduous and dry deciduous forests in the eastern part. Other habitats of Navsari consist of inland and saltwater wetlands, scrublands, and agroecosystems (agricultural fields and agroforestry fields). Wetlands are dominated by vegetation like Piludi *Salvadora persica*, Gando Baval *Prosopis juliflora*, various mangrove species, sedges, and other hydrophytic plants. Apart from that, some wetlands have vegetation consisting of *Typha sp.* which provide habitat for skulker species like warblers and bitterns (Patel 2021). The agriculture fields have major crops namely rice, wheat, sugarcane, and some vegetable crops. Agroforestry fields consist of mainly Agri-Silvi, Agri-Horti and Agri-Silvi-Horti systems. Where major tree species are *Tectona grandis*, *Eucalyptus sp.*, *Leucaena leucocephala*, *Ailanthus sp.* along with agriculture crops like wheat, rice and sugarcane and horticulture crops like mango, sapota, guava and other vegetables. In the current study, we have focused on the western part of the district (Fig. 1). Which is covered by wetlands, scrublands, and agroecosystems.

Methods

We conducted the study from January 2010 to December 2020 in the western part of Navsari district, Gujarat, India. We conducted preliminary study from 2010 to 2015, documenting bird diversity through occasional visits to the study area. We conducted intensive field surveys from 2016–2020 (Till initial months of 2020 afterwards the survey wasn't possible due to Covid-19 restrictions). We selected potential survey sites based on prior experience, literature review, feedback received from local birdwatchers, social media, and various citizen science platforms. The major proportion of the study area constitutes wetlands followed by scrubland and agroecosystems. We laid a total of 10 transects of 500m in length across the study site (Table 1). We walked each transect at peak bird activity time during 06:00-10:00 and 16:00-19:30. We surveyed the transect at least once a month and recorded the number of species, their identity and number of individuals. We observed birds with the aid of 12 X 50 binoculars and identified those using Grimmett et al. (2011). We used a DSLR camera for close examinations of birds that we could not identify on the field. Apart from systematic transect sampling, we have included the opportunistic sightings of birds from specific locations of the study area. Bird species recorded by other birders and researchers are also included with due acknowledgment. We have also included bird species records from the published literature that weren't encountered during our sampling. We calculated order and family-wise number of species according to Praveen et al. 2016. We determined whether a species was resident or migratory in the study area following Grimmett et al. (2011), Birds of the World (www.birdsoftheworld.org), and from our personal observations. We classified bird feeding guilds following Wilman et al. (2014). We evaluated threat levels to species using the Red List (2019) prepared by the International Union for Conservation of Nature (IUCN).

Table 1: List of transects and their respective habitat types

SN	Name of the Transect	Habitat types
1	Gandhi college - Kalthan	Agricultural field, Lake, Scrubland, Canal flooded area
2	Sultanpur wetland	Wetland, Salt marshes and Agriculture field
3	Aat -Machiwad	Wetland, Shrubland, Fish Farms, Agriculture field
4	Aat -Dandi village	Wetland, Scrubland, Fish farm and Seashore
5	Abrama - Chijgam	Wetland, Fish farm, Lake
6	Dipla - Vansi borsi	Wetland, Estuary, Fish farm and sea
7	Jalalpore - Macchad	River, Agriculture field
8	Gandhi Fatak - Sisodra	Agricultural field, Lake, Canal flooded area
9	Movasa-Kotha-Bhat	Wetland, Agriculture field, seashore
10	Batha - Devsar	Agricultural field, Lake

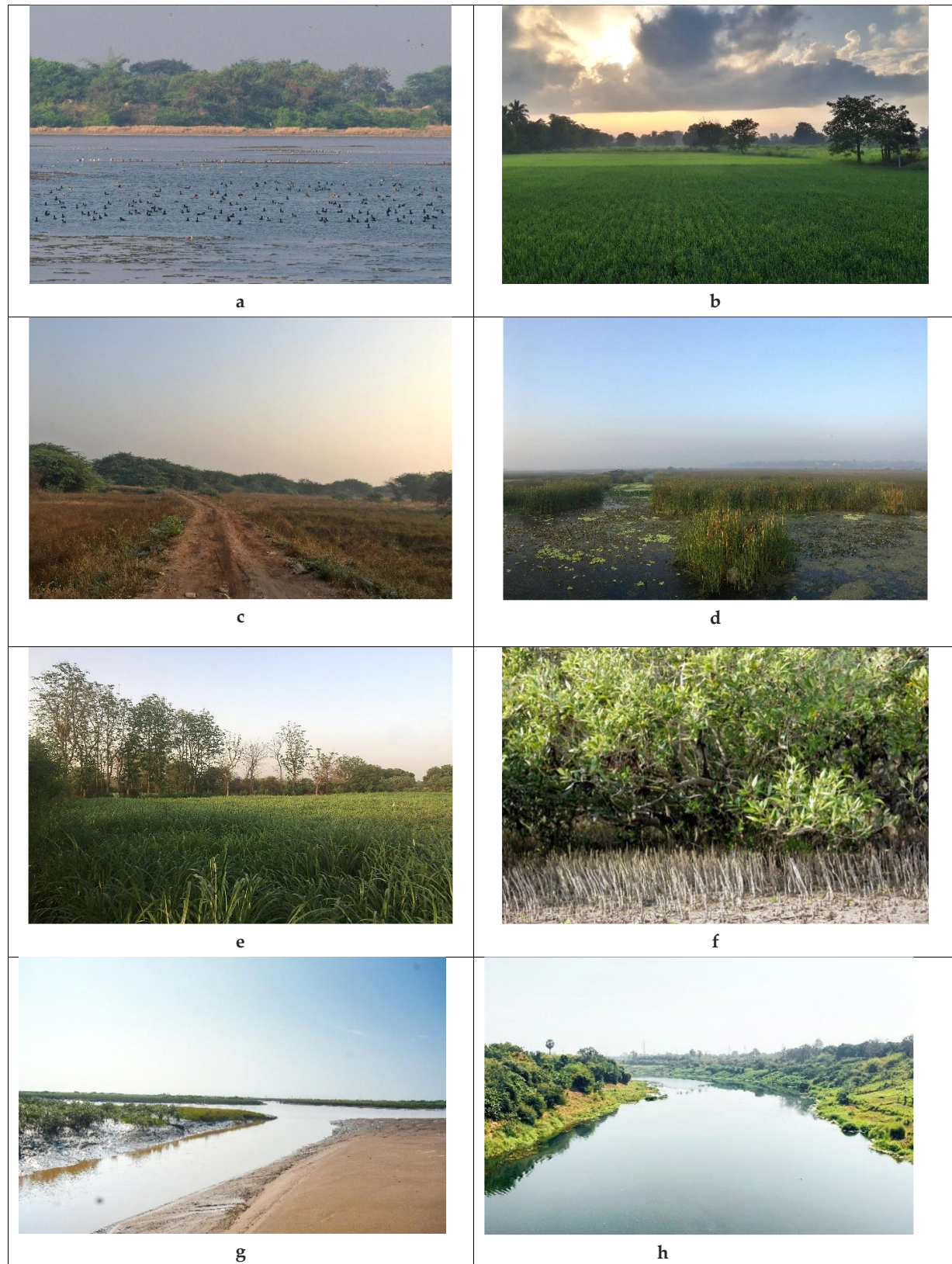


Figure 2. Different type of habitat of study area. a. Wetland b. Agriculture field c. Scrubland d. Wetland dominated with *Typha* sp. e. Agroforestry field f. Mangroves g. Estuary (Coastal wetland) h. Riverine area (Inland wetland), Photo courtesy: a, b, c, d & f-Minal Patel, e-Neel Tandel & h- Priyank Kapdi

3. RESULTS

We recorded a total of 277 (Table 2) species of birds belonging to 20 orders, 72 families, and 175 genera during the study period. As per the survey, the order Passeriformes (104) had the most recorded species followed by Charadriiformes (46), Accipitriformes,

Anseriformes, and Pelecaniformes respectively (19). From a total of 72 families, Anatidae (19) followed by Accipitridae (18) and Scolopacidae (17) dominated in the Navsari outskirts area (Fig. 3). Of the recorded species, 157 bird species are resident followed by 97 winter migrants and 8 bird species residents as well winter migrants and four bird species passage migrant and monsoon breeding. As per the IUCN category, 1% of the birds belong to the endangered category, 4% to the near-threatened category and 3% to the vulnerable category. In the feeding guild, 123 bird species of recorded species are feeding on invertebrates followed by 52 bird species on plant parts and seeds, 52 bird species on terrestrial vertebrates, fishes, and carrion/carcasses, 13 bird species on fruits and nectar and 38 bird species are omnivore. (Fig. 4).

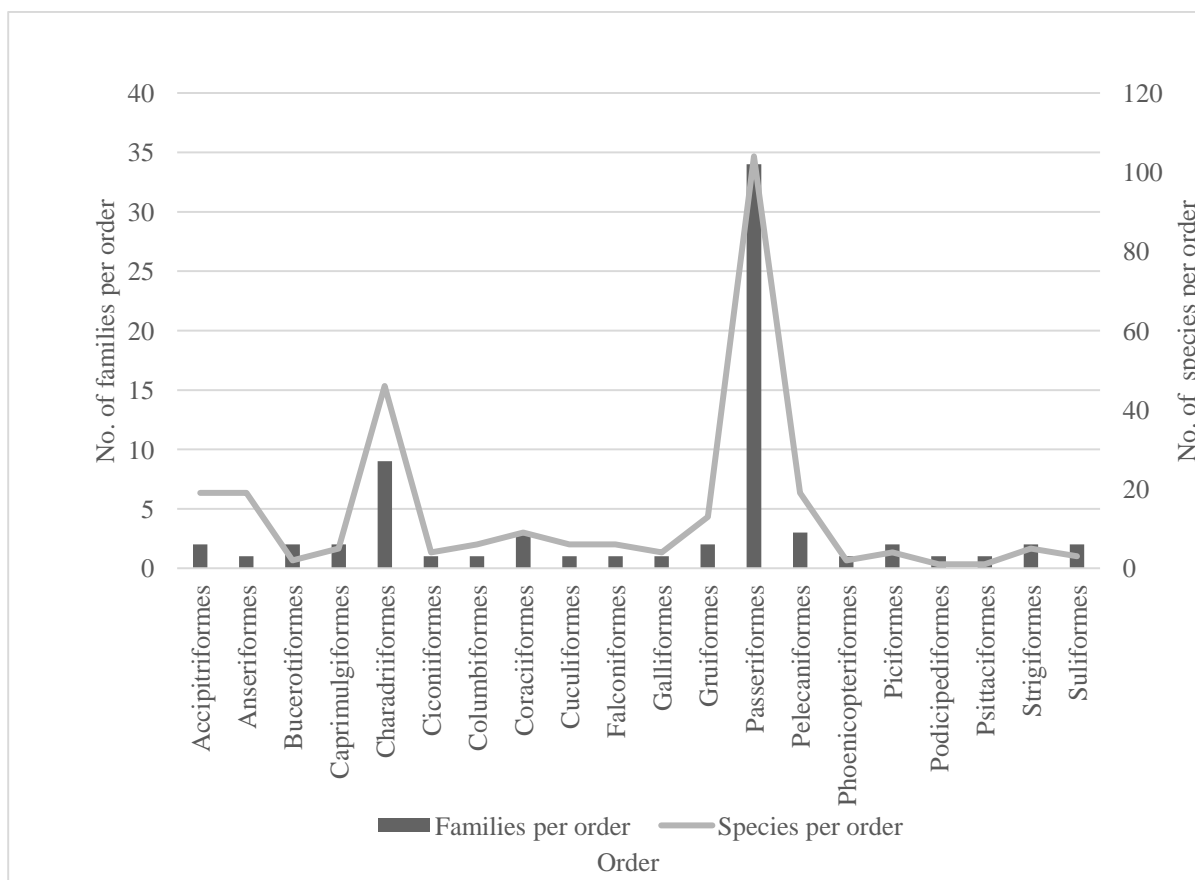


Figure 3. Family and order wise representation of Avifauna from Western Navsari district, South Gujarat

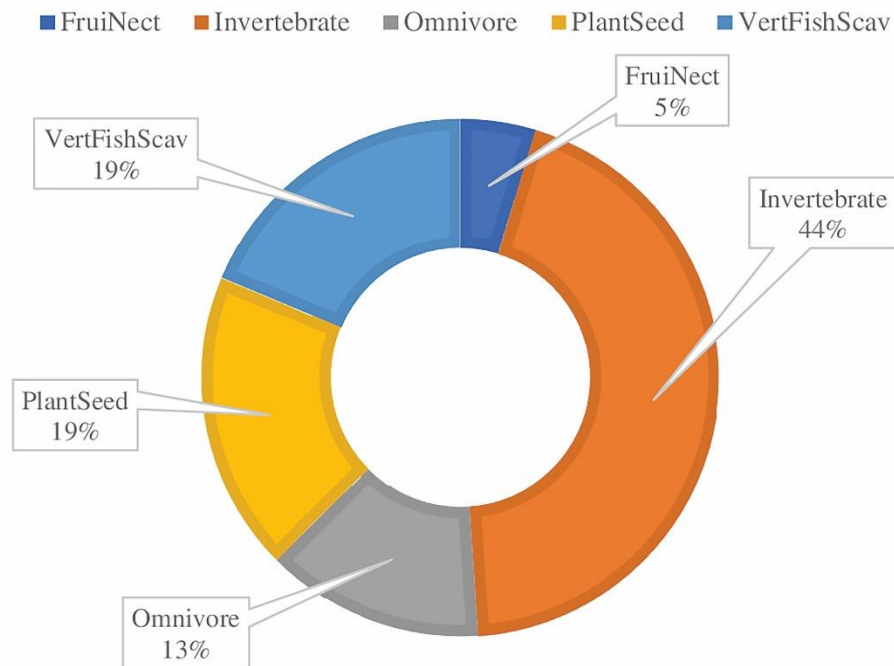


Figure 4: Feeding guild representation of avifauna of Western Navsari. Majority of bird species dependent on invertebrates. FruiNect - feeding on fruits and nectar, Invertebrate - feeding on aquatic and terrestrial invertebrates, PlantSeed - feeding on plant parts and seeds, VertFishScav - feeding on vertebrates, fishes and scavenging on carrion.



Figure 5: Noteworthy species with morphological aberration. Photo courtesy: a & c - Priyank Kapdi, b - Dipak Patel

Table 2: Checklist of avifauna of Western Navsari

SN	Species	IUCN status	WPA schedule	Migratory status	Feeding guild
ORDER: GALLIFORMES					
FAMILY: PHASIANIDAE					
1	Painted Francolin <i>Francolinus pictus</i>	LC	IV	R	OM
2	Grey Francolin <i>Francolinus pondicerianus</i>	LC	IV	R	PS
3	Indian Peafowl <i>Pavo cristatus</i>	LC	I	R	PS
4	Rain Quail <i>Coturnix coromandelica</i>	LC	IV	M, B	PS
ORDER: ANSERIFORMES					
FAMILY: ANATIDAE					
5	Lesser Whistling Duck <i>Dendrocygna javanica</i>	LC	IV	R	PS

6	Greylag Goose <i>Anser anser</i>	LC	IV	W	PS
7	Bar-Headed Goose <i>Anser indicus</i>	LC	IV	W	PS
8	Knob Billed Duck <i>Sarkidiornis melanotos</i>	LC	IV	R	PS
9	Ruddy Shelduck <i>Tadorna ferruginea</i>	LC	IV	W	PS
10	Cotton Pygmy Goose <i>Nettapus coromandelianus</i>	LC	IV	R	PS
11	Gadwall <i>Mareca strepera</i>	LC	IV	W	PS
12	Eurasian Wigeon <i>Mareca Penelope</i>	LC	IV	W	PS
13	Mallard <i>Anas platyrhynchos</i>	LC	IV	W	OM
14	Indian Spot-Billed Duck <i>Anas poecilorhyncha</i>	LC	IV	R	PS
15	Northern Shoveler <i>spatula clypeata</i>	LC	IV	W	I
16	Northern Pintail <i>Anas acuta</i>	LC	IV	W	PS
17	Garganey <i>Spatula querquedula</i>	LC	IV	W	PS
18	Common Teal <i>Anas crecca</i>	LC	IV	W	PS
19	Comb Duck <i>Sarkidiornis melanotos</i>	LC	IV	W	PS
20	Red Crested Pochard <i>Netta rufina</i>	LC	IV	W	PS
21	Common Pochard <i>Aythya ferina</i>	VU	IV	W	PS
22	Ferruginous Duck/ White Eye Pochard <i>Aythya nyroca</i>	NT	IV	W	PS
23	Tufted Duck <i>Aythya fuligula</i>	LC	IV	W	OM
ORDER: PODICIPEDIFORMES					
FAMILY: PODICIPEDIDAE					
24	Little Grebe <i>Tachybaptus ruficollis</i>	LC	IV	R	I
ORDER: CICONIIFORMES					
FAMILY: CICONIIDAE					
25	Painted Stork <i>Mycteria leucocephala</i>	NT	IV	R	VFC
26	Asian Openbill <i>Anastomus oscitans</i>	LC	IV	R	I
27	Woolly Necked Stork <i>Ciconia episcopus</i>	VU	IV	R	VFC
28	European White Stork <i>Ciconia Ciconia</i>	LC	I	W	VFC
ORDER: PHOENICOPTERIFORMES					
FAMILY: PHOENICOPTERIDAE					
29	Greater Flamingo <i>Phoenicopterus roseus</i>	LC	IV	R	OM
30	Lesser Flamingo <i>Phoeniconaias minor</i>	NT	IV	R	PS
ORDER: PELECANIFORMES					
FAMILY: THRESKIORNITHIDAE					
31	Black Headed Ibis <i>Threskiornis melanocephalus</i>	NT	IV	R	VFC
32	Indian Black Ibis/ Red-Naped Ibis <i>Pseudibis papillosa</i>	LC	IV	R	OM
33	Glossy Ibis <i>Plegadis falcinellus</i>	LC	IV	R, W	I
34	Eurasian Spoonbill <i>Platalea leucorodia</i>	LC	I	R	I
FAMILY: ARDEIDAE					
35	Yellow Bittern <i>Ixobrychus sinensis</i>	LC	IV	R	I
36	Cinnamon Bittern <i>Ixobrychus cinnamomeus</i>	LC	IV	R	VFC
37	Black Bittern <i>Ixobrychus flavicollis</i>	LC	IV	R, M	VFC
38	Eurasian Bittern/ Great Bittern <i>Botaurus stellaris</i>	LC	IV	W	VFC
39	Striated Heron <i>Butorides striata</i>	LC	IV	R	VFC
40	Black Crowned Night Heron <i>Nycticorax nycticorax</i>	LC	IV	R	VFC

41	Indian Pond Heron <i>Ardeola grayii</i>	LC	IV	R	OM
42	Grey Heron <i>Ardea cinerea</i>	LC	IV	R	VFC
43	Purple Heron <i>Ardea purpurea</i>	LC	IV	R	VFC
44	Cattle Egret <i>Bubulcus ibis</i>	LC	IV	R	I
45	Great Egret <i>Ardea alba</i>	LC	IV	R	VFC
46	Intermediate Egret <i>Ardea intermedia</i>	LC	IV	R	VFC
47	Little Egret <i>Egretta garzetta</i>	LC	IV	R	I
48	Western Reef Egret <i>Egretta gularis</i>	LC	IV	R	I
FAMILY: PELECANIDAE					
49	Great White Pelican <i>Pelecanus onocrotalus</i>	LC	IV	W	VFC
ORDER: SULIFORMES					
FAMILY: ANHINGIDAE					
50	Oriental Darter <i>Anhinga melanogaster</i>	NT	IV	R	VFC
FAMILY: PHALACROCORACIDAE					
51	Little Cormorant <i>Microcarbo niger</i>	LC	IV	R	VFC
52	Indian Cormorant <i>Phalacrocorax fuscicollis</i>	LC	IV	R	VFC
ORDER: FALCONIFORMES					
FAMILY: FALCONIDAE					
53	Common Kestrel <i>Falco tinnunculus</i>	LC	IV	W	VFC
54	Red Necked Falcon <i>Falco chicquera</i>	NT	I	R	VFC
55	Amur Falcon <i>Falco amurensis</i>	LC	IV	PM	I
56	Eurasian Hobby <i>Falco Subbuteo</i>	LC	IV	PM	I
57a	Tundra Peregrine Falcon <i>Falco peregrines</i>	LC	I	W	VFC
57b	Indian Shaheen Falcon <i>Falco peregrines peregrinator</i>	LC	I	R	VFC
ORDER: ACCIPITRIFORMES					
FAMILY: PANDIONIDAE					
58	Osprey <i>Pandion haliaetus</i>	LC	I	W	VFC
FAMILY: ACCIPITRIDAE					
59	Black Winged Kite <i>Elanus caeruleus</i>	LC	I	R	VFC
60	Black Kite <i>Milvus migrans</i>	LC	I	R	VFC
61	Black -Eared Kite <i>Milvus migrans lineatus</i>	LC	I	W	VFC
62	Brahminy Kite <i>Haliastur Indus</i>	LC	I	R	VFC
63	Oriental Honey Buzzard <i>Pernis ptilorhynchus</i>	LC	I	R	I
64	Egyptian Vulture <i>Neophron percnopterus</i>	EN	I	R, W	VFC
65	Short-Toed Snake Eagle <i>Circaetus gallicus</i>	LC	I	R	VFC
66	Western Marsh Harrier <i>Circus aeruginosus</i>	LC	I	W	VFC
67	Pallid Harrier <i>Circus macrourus</i>	NT	I	W	VFC
68	Montagu's Harrier <i>Circus pygargus</i>	LC	I	W	VFC
69	Shikra <i>Accipiter badius</i>	LC	I	R	VFC
70	Eurasian Sparrowhawk <i>Accipiter nisus</i>	LC	I	W	VFC
71	White-Eyed Buzzard <i>Butastur teesa</i>	LC	I	R	VFC
72	Indian Spotted Eagle <i>Clanga hastata</i>	VU	I	W	VFC
73	Greater Spotted Eagle <i>Clanga clanga</i>	VU	I	W	VFC
74	Booted Eagle <i>Hieraaetus pennatus</i>	LC	I	W	VFC

75	Steppe Eagle <i>Aquila nipalensis</i>	EN	I	W	VFC
76	Eastern Imperial Eagle <i>Aquila heliaca</i>	VU	I	W	VFC
ORDER: GRUIFORMES					
FAMILY: RALLIDAE					
77	Slaty-Breasted Rail <i>Lewinia striata</i>	LC	IV	MB, R	PS
78	Baillon's Crake <i>Zapornia pusilla</i>	LC	IV	W	I
79	Western Water Rail <i>Rallus aquaticus</i>	LC	IV	W	OM
80	Ruddy Breasted Crake <i>Zapornia fusca</i>	LC	IV	R	PS
81	White Breasted Waterhen <i>Amaurornis phoenicurus</i>	LC	IV	R	I
82	Brown Crake <i>Zapornia akool</i>	LC	IV	R	OM
83	Watercock <i>Gallinula cinerea</i>	LC	IV	MB, R	PS
84	Purple Swamphen <i>Porphyrio porphyrio</i>	LC	IV	R	PS
85	Common Moorhen <i>Gallinula chloropus</i>	LC	IV	R	OM
86	Common Coot <i>Fulica atra</i>	LC	IV	R, W	PS
FAMILY: GRUIDAE					
87	Demoiselle Crane <i>Grus virgo</i>	LC	IV	W	PS
88	Common Crane <i>Grus grus</i>	LC	IV	W	PS
89	Sarus Crane <i>Antigone Antigone</i>	VU	IV	R	PS
ORDER: CHARADRIIFORMES					
FAMILY: TRUNICIDAE					
90	Barred Buttonquail <i>Turnix suscitator</i>	LC	IV	R	PS
FAMILY: JACANIDAE					
91	Pheasant Tailed Jacana <i>Hydrophasianus chirurgus</i>	LC	IV	R	I
92	Bronze Winged Jacana <i>Metopidius indicus</i>	LC	IV	R	PS
FAMILY: RECURVIROSTRIDAE					
93	Black Winged Stilt <i>Himantopus Himantopus</i>	LC	IV	R	I
94	Pied Avocet <i>Recurvirostra avosetta</i>	LC	IV	R, W	I
FAMILY: BURHINIDAE					
95	Indian Thick Knee <i>Burhinus indicus</i>	LC	IV	R	OM
96	Red Wattled Lapwing <i>Vanellus indicus</i>	LC	IV	R	I
FAMILY: CHARADRIIDAE					
97	White Tailed Lapwing <i>Vanellus leucurus</i>	LC	IV	MB, W	I
98	Pacific Golden Plover <i>Pluvialis fulva</i>	LC	IV	W	I
99	Little Ringed Plover <i>Charadrius dubius</i>	LC	IV	R	I
100	Kentish Plover <i>Charadrius alexandrinus</i>	LC	IV	R	I
101	Greater Sand Plover <i>Charadrius leucophaea</i>	LC	IV	W	I
102	Lesser Sand Plover <i>Charadrius mongolus</i>	LC	IV	W	I
FAMILY: ROSTRATULIDAE					
103	Greater Painted Snipe <i>Rostratula benghalensis</i>	LC	IV	R	I
FAMILY: SCOLOPACIDAE					
104	Ruff <i>Calidris pugnax</i>	LC	IV	W	OM
105	Black Tailed Godwit <i>Limosa limosa</i>	NT	IV	W	I
106	Bar Tailed Godwit <i>Limosa lapponica</i>	NT	IV	W	I
107	Eurasian Curlew <i>Numenius arquata</i>	NT	IV	W	OM
108	Spotted Redshank <i>Tringa erythropus</i>	LC	IV	W	I

109	Common Redshank <i>Tringa totanus</i>	LC	IV	W	I
110	Marsh Sandpiper <i>Tringa stagnatilis</i>	LC	IV	W	I
111	Common Greenshank <i>Tringa nebularia</i>	LC	IV	W	I
112	Green Sandpiper <i>Tringa ochropus</i>	LC	IV	W	I
113	Wood Sandpiper <i>Tringa glareola</i>	LC	IV	W	I
114	Common Sandpiper <i>Actitis hypoleucos</i>	LC	IV	W	OM
115	Common Snipe <i>Gallinago gallinago</i>	LC	IV	W	I
116	Little Stint <i>Calidris minuta</i>	LC	IV	W	I
117	Sanderling <i>Calidris alba</i>	LC	IV	W	I
118	Curlew Sandpiper <i>Calidris ferruginea</i>	NT	IV	W	I
119	Jack Snipe <i>Lymnocyptes minimus</i>	LC	IV	W	I
120	Dunlin <i>Calidris alpina</i>	LC	IV	W	I
FAMILY: GLAREOLIDAE					
121	Small Pratincole/ Little Pratincole <i>Glareola lacteal</i>	LC	IV	R	I
122	Collared Pratincole <i>Glareola pratincole</i>	LC	IV	R	I
123	Oriental Pratincole <i>Glareola maldivarum</i>	LC	IV	R	I
FAMILY: LARIDAE					
124	Heuglin's Gull/ Lesser Black-Backed Gull <i>Larus fuscus</i>	LC	IV	W	VFC
125	Pallas's Gull <i>Ichthyaetus ichthyaetus</i>	LC	IV	W	VFC
126	Brown Headed Gull <i>Chroicocephalus brunnicephalus</i>	LC	IV	W	VFC
127	Black Headed Gull <i>Chroicocephalus ridibundus</i>	LC	IV	W	VFC
128	Slender Billed Gull <i>Chroicocephalus genei</i>	LC	IV	R, W	OM
129	Gull Billed Tern <i>Gelochelidon nilotica</i>	LC	IV	W	OM
130	River Tern <i>Sterna aurantia</i>	NT	IV	R	OM
131	Little Tern <i>Sternula albifrons</i>	LC	IV	R	VFC
132	Whiskered Tern <i>Chlidonias hybrid</i>	LC	IV	W	VFC
133	White Winged Tern <i>Chlidonias leucopterus</i>	LC	IV	W	I
134	Indian Skimmer <i>Rynchops albigollis</i>	VU	IV	W	VFC
135	Caspian Gull <i>Larus cachinnans</i>	LC	IV	W	VFC
ORDER: COLUMBIFORMES					
FAMILY: COLUMBIDAE					
136	Rock Pigeon <i>Columba livia</i>	LC	IV	R	PS
137	Eurasian Collared Dove <i>Streptopelia decaocto</i>	LC	IV	R	PS
138	Red Collared Dove <i>Streptopelia tranquebarica</i>	LC	IV	R	PS
139	Spotted Dove <i>Streptopelia chinensis</i>	LC	IV	R	PS
140	Laughing Dove <i>Streptopelia senegalensis</i>	LC	IV	R	PS
141	Yellow Legged Green Pigeon/ Yellow Footed Green Region <i>Treron Phoenicopterus</i>	LC	IV	R	FN
ORDER: PSITTACIFORMES					
FAMILY: PSITTACULIDAE					
142	Rose Ringed Parakeet <i>Psittacula krameria</i>	LC	IV	R	FN
ORDER: CUCULIFORMES					
FAMILY: CUCULIDAE					

143	Pied Cuckoo/ Jacobin Cuckoo <i>Clamator jacobinus</i>	LC	IV	MB	I
144	Common Hawk Cuckoo <i>Hierococcyx varius</i>	LC	IV	R	I
145	Common Cuckoo/ Eurasian Cuckoo <i>Cuculus canorus</i>	LC	IV	MB	I
146	Grey Bellied Cuckoo <i>Cacomantis passerines</i>	LC	IV	R	I
147	Asian Koel <i>Eudynamys scolopaceus</i>	LC	IV	R	FN
148	Greater Coucal/ Southern Coucal/ Crow Pheasant <i>Centropus sinensis parroti</i>	LC	IV	R	OM
ORDER: STRIGIFORMES					
FAMILY: TYTONIDAE					
149	Common Barn Owl/ Barn Owl <i>Tyto alba</i>	LC	IV	R	VFC
FAMILY: STRIGIDAE					
150	Spotted Owlet <i>Athene brama</i>	LC	IV	R	I
151	Indian Scops Owl <i>Otus bakkamoena</i>	LC	IV	R	I
152	Oriental Scops Owl <i>Otus sunia</i>	LC	IV	R	I
ORDER: CAPRIMULGIFORMES					
FAMILY: CAPRIMULGIDAE					
153	Short-Eared Owl <i>Asio flammeus</i>	LC	IV	W	VFC
154	Indian Nightjar <i>Caprimulgus asiaticus</i>	LC	IV	R	I
155	Jungle Nightjar <i>Caprimulgus indicus</i>	LC	IV	R	I
156	Savanna Nightjar <i>Caprimulgus affinis</i>	LC	IV	R	I
FAMILY: APODIDAE					
157	Asian Palm Swift <i>Cypsiurus balasiensis</i>	LC	IV	R	I
158	Indian House Swift <i>Apus affinis</i>	LC	IV	R	I
ORDER: BUCEROTIFORMES					
FAMILY: UPUPIDAE					
159	Common Hoopoe <i>Upupa epops</i>	LC	IV	R, W	I
FAMILY: BUCEROTIDAE					
160	Indian Grey Hornbill <i>Ocyrceros birostris</i>	LC	IV	R	FN
ORDER: CORACIIFORMES					
FAMILY: CORACIIDAE					
161	Indian Roller <i>Coracias benghalensis</i>	LC	IV	R	OM
162	European Roller <i>Coracias garrulus</i>	LC	IV	PM	I
FAMILY: ALCEDINIDAE					
163	White Throated Kingfisher <i>Halcyon smyrnensis</i>	LC	IV	R	I
164	Pied Kingfisher <i>Ceryle rudis</i>	LC	IV	R	VFC
165	Common Kingfisher <i>Alcedo atthis</i>	LC	IV	R	VFC
166	Black Capped Kingfisher <i>Halcyon pileata</i>	LC	IV	R	I
FAMILY: MEROPIDAE					
167	Green Bee Eater <i>Merops orientalis</i>	LC	IV	R	I
168	Blue Tailed Bee Eater <i>Merops philippinus</i>	LC	IV	R	I
169	Blue Cheeked Bee Eater <i>Merops persicus</i>	LC	IV	MB, PM	I
ORDER: PICIFORMES					
FAMILY: MEGALAIMIDAE					
170	Coppersmith Barbet <i>Psilopogon haemacephalus</i>	LC	IV	R	FN
FAMILY: PICIDAE					

171	Eurasian Wryneck <i>Jynx torquilla</i>	LC	IV	W	I
172	Yellow Crowned Woodpecker/ Yellow-Fronted Pied Woodpecker <i>Leiopicus mahrattensis</i>	LC	IV	R	I
173	Lesser Golden-Backed Woodpecker <i>Dinopium benghalense</i>	LC	IV	R	I
ORDER: PASSERIFORMES					
FAMILY: PITTIDAE					
174	Indian Pitta <i>Pitta brachyura</i>	LC	IV	MB	I
FAMILY: VANGIDAE					
175	Common Wood shrike <i>Tephrodornis pondicerianus</i>	LC	IV	R	I
176	Bar winged flycatcher shrike <i>Hemipus picatus</i>	LC	IV	WM	I
FAMILY: CEMPEPHAGIDAE					
177	Small Minivet <i>Pericrocotus cinnamomeus</i>	LC	IV	R	I
FAMILY: AFGITHINIDAE					
178	Common Iora <i>Aegithina tiphia</i>	LC	IV	R	I
FAMILY: LANIIDAE					
179	Isabelline Shrike <i>Lanius isabellinus</i>	LC	IV	W	I
180	Long Tailed Shrike <i>Lanius schach</i>	LC	IV	R	I
181	Bay Backed Shrike <i>Lanius vittatus</i>	LC	IV	R	I
FAMILY: DICRURUS					
182	Black Drongo <i>Dicrurus macrocercus</i>	LC	IV	R	OM
183	White Bellied Drongo <i>Dicrurus caerulescens</i>	LC	IV	R, W	I
184	Ashy Drongo <i>Dicrurus leucophaeus</i>	LC	IV	W	I
FAMILY: ORIOLODAE					
185	Indian Golden Oriole <i>Oriolus kundoo</i>	LC	IV	R	OM
FAMILY: RHIPIDURIDAE					
186	White Spotted Fantail <i>Rhipidura albogularis</i>	LC	IV	R	I
187	White Browed Fantail <i>Rhipidura aureola</i>	LC	IV	R	I
FAMILY: MONARCHIDAE					
188	Indian Paradise Flycatcher <i>Terpsiphone paradisi</i>	LC	IV	R	I
FAMILY: CORVIDAE					
189	Rufous Treepie <i>Dendrocitta vagabunda</i>	LC	IV	R	OM
190	House Crow <i>Corvus splendens</i>	LC	IV	R	VFC
191	Jungle Crow /Large -Billed Crow <i>Corvus macrorhynchos</i>	LC	IV	R	FN
FAMILY: PARIDAE					
192	Great Tit / Cinereous Tit <i>Parus cinereus</i>	LC	IV	R	I
FAMILY: HIRUNDINIDAE					
193	Wire Tailed Swallow <i>Hirundo smithii</i>	LC	IV	R	I
194	Red Rumped Swallow <i>Cecropis daurica</i>	LC	IV	R	I
195	Barn Swallow <i>Hirundo rustica</i>	LC	IV	W	I
FAMILY: ARTAMIDAE					
196	Ashy Wood swallow <i>Artamus fuscus</i>	LC	IV	R	I
FAMILY: ALAUDIDAE					
197	Rufous Tailed Lark <i>Ammomanes phoenicura</i>	LC	IV	R	OM

198	Ashy Crowned Sparrow Lark <i>Eremopterix griseus</i>	LC	IV	R	PS
199	Crested Lark <i>Galerida cristata</i>	LC	IV	R	PS
200	Sykes's Lark <i>Galerida deva</i>	LC	IV	R	PS
201	Malabar Lark <i>Galerida malabarica</i>	LC	IV	R	OM
202	Greater Short Toed Lark <i>Calandrella brachydactyla</i>	LC	IV	W	I
FAMILY: PYCNONOTIDAE					
203	Red Whiskered Bulbul <i>Pycnonotus jocosus</i>	LC	IV	R	OM
204	Red Vented Bulbul <i>Pycnonotus cafer</i>	LC	IV	R	OM
205	White Browed Bulbul <i>Pycnonotus luteolus</i>	LC	IV	R	FN
FAMILY: CISTICOLIDAE					
206	Plain Prinia <i>Prinia inornate</i>	LC	IV	R	I
207	Ashy Prinia <i>Prinia socialis</i>	LC	IV	R	I
208	Jungle Prinia <i>Prinia sylvatica</i>	LC	IV	R	I
209	Grey Breasted Prinia <i>Prinia hodgsonii</i>	LC	IV	R	I
210	Zitting Cisticola <i>Cisticola juncidis</i>	LC	IV	R	I
211	Common Tailorbird <i>Orthotomus sutorius</i>	LC	IV	R	I
FAMILY: ACROCEPHALIDAE					
212	Clamorous Reed Warbler <i>Acrocephalus stentoreus</i>	LC	IV	R	I
213	Moustached Warbler <i>Acrocephalus melanopogon</i>	LC	IV	W	I
214	Paddy field Warbler <i>Acrocephalus Agricola</i>	LC	IV	W	I
215	Booted Warbler <i>Iduna caligata</i>	LC	IV	W	I
216	Sykes's Warbler <i>Iduna rama</i>	LC	IV	W	I
FAMILY: PHYLLOSCOPIDAE					
217	Common Chiffchaff <i>Phylloscopus collybita</i>	LC	IV	W	I
218	Sulphur Bellied Warbler <i>Phylloscopus griseolus</i>	LC	IV	W	I
219	Greenish Leaf Warbler <i>Seicercus trochiloides</i>	LC	IV	W	I
FAMILY: SYLVIIDAE					
220	Lesser Whitethroat <i>Sylvia curruca</i>	LC	IV	W	I
221	Yellow Eyed Babbler <i>Chrysomma sinense</i>	LC	IV	R	I
FAMILY: MUSCICAPIDAE					
222	Bluethroat <i>Luscinia svecica</i>	LC	IV	W	I
223	Indian Robin <i>Saxicoloides fulicatus</i>	LC	IV	R	I
224	Oriental Magpie Robin <i>Copsychus saularis</i>	LC	IV	R	I
225	Pied Bush chat <i>Saxicola caprata</i>	LC	IV	R	I
226	Siberian Stonechat <i>Saxicola maurus</i>	LC	IV	W	I
227	Isabelline Wheatear <i>Oenanthe isabelline</i>	LC	IV	W	I
228	Desert Wheatear <i>Oenanthe deserti</i>	LC	IV	W	I
229	Blue Rock Thrush <i>Monticola solitarius</i>	LC	IV	W	OM
230	Spotted Flycatcher <i>Muscicapa striata</i>	LC	IV	PM	I
231	Asian Brown Flycatcher <i>Muscicapa dauurica</i>	LC	IV	R, W	I
232	Red Breasted Flycatcher <i>Ficedula parva</i>	LC	IV	W	I
233	Brown Rock Chat <i>Oenanthe fusca</i>	LC	IV	R	I
234	Tickell's Blue Flycatcher <i>Cyornis tickelliae</i>	LC	IV	R	I
235	Black Redstart <i>Phoenicurus ochrurus</i>	LC	IV	W	I
FAMILY: STENOSTIRIDAE					

236	Grey Headed Canary Flycatcher <i>Culicicapa ceylonensis</i>	LC	IV	W	I
FAMILY: CHLOROPSEIDAE					
237	Golden Fronted Leafbird <i>Chloropsis aurifrons</i>	LC	IV	R	FN
238	Jerdon's Leafbird <i>Chloropsis jerdoni</i>	LC	IV	R	FN
FAMILY: DICAIEIDAE					
239	Thick Billed Flowerpecker <i>Dicaeum agile</i>	LC	IV	R	FN
240	Pale Billed Flowerpecker <i>Dicaeum erythrorhynchos</i>	LC	IV	R	FN
FAMILY: NECTARINIIDAE					
241	Purple Rumped Sunbird <i>Leptocoma zeylonica</i>	LC	IV	R	FN
242	Purple Sunbird <i>Cinnyris asiaticus</i>	LC	IV	R	FN
FAMILY: PASSERIDAE					
243	House Sparrow <i>Passer domesticus</i>	LC	IV	R	PS
244	Yellow-Throated Sparrow <i>Gymnoris xanthocollis</i>	LC	IV	R	OM
FAMILY: PLOCEIDAE					
245	Baya Weaver <i>Ploceus philippinus</i>	LC	IV	R	PS
246	Black Breasted Weaver <i>Ploceus benghalensis</i>	LC	IV	R	PS
FAMILY: ESTRILIDAE					
247	Indian silver bill <i>Euodice malabarica</i>	LC	IV	R	PS
248	Red Munia <i>Amandava amandava</i>	LC	IV	R	PS
249	Scaly Breasted Munia <i>Lonchura punctulata</i>	LC	IV	R	PS
250	Tricoloured Munia <i>Lonchura Malacca</i>	LC	IV	R	PS
251	White-rumped Munia <i>Lonchura striata</i>	LC	IV	R	PS
FAMILY: MOTACILLIDAE					
252	White Wagtail <i>Motacilla alba</i>	LC	IV	W	I
253	Western Yellow Wagtail <i>Motacilla flava</i>	LC	IV	W	I
254	Citrine Wagtail <i>Motacilla citreola</i>	LC	IV	W	I
255	Paddy field Pipit <i>Anthus rufulus</i>	LC	IV	R	I
256	Tawny Pipit <i>Anthus campestris</i>	LC	IV	W	I
257	Tree Pipit <i>Anthus trivialis</i>	LC	IV	W	I
258	Long Billed Pipit <i>Anthus similis</i>	LC	IV	W, R?	I
FAMILY: FRINGILLIDAE					
259	Common Rose finch <i>Carpodacus erythrinus</i>	LC	IV	W	PS
FAMILY: EMBERIZIDAE					
260	Crested Bunting <i>Emberiza lathami</i>	LC	IV	R	PS
261	Grey Necked Bunting <i>Emberiza buchanani</i>	LC	IV	W	PS
262	Black Headed Bunting <i>Emberiza melanocephala</i>	LC	IV	W	PS
263	Red Headed Bunting <i>Emberiza bruniceps</i>	LC	IV	W	PS
264	Striolated Bunting <i>Emberiza striolata</i>	LC	IV	R	PS
FAMILY: STURNIDAE					
265	Jungle Myna <i>Acridotheres fuscus</i>	LC	IV	R	OM
266	Common Myna <i>Acridotheres tristis</i>	LC	IV	R	OM
267	Bank Myna <i>Acridotheres ginginianus</i>	LC	IV	R	OM
268	Rosy Starling <i>Pastor roseus</i>	LC	IV	W	I
269	Chestnut-Tailed Starling <i>Sturnia malabarica</i>	LC	IV	R	OM

270	Malabar Starling <i>Sturnia blythii</i>	LC	IV	V, R?	OM
271	Brahminy Starling <i>Sturnia pagodarum</i>	LC	IV	R	OM
272	Common Starling <i>Sturnus vulgaris</i>	LC	IV	W	OM
273	Asian Pied Starling <i>Gracupica contra</i>	LC	IV	R	OM
FAMILY: TIMALIIDAE					
274	Tawny Bellied Babbler <i>Dumetia hypertyra</i>	LC	IV	R	I
FAMILY: LEIOTHRICHIDAE					
275	Jungle Babbler <i>Turdoides striata</i>	LC	IV	R	OM
276	Common Babbler <i>Argya caudata</i>	LC	IV	R	OM
FAMILY: ZOSTEROPIDAE					
277	Oriental White Eye <i>Zosterops palpebrosus</i>	LC	IV	R	OM
ORDER: ANSERIFORMES					
FAMILY: ANATIDAE					
*	White Faced Whistling Duck <i>Dendrocygna Viduata</i>	LC	--	Note	

(IUCN Red List categories: EN: Endangered, LC: Least concern, NT: Near Threatened, VU: Vulnerable, DD: Data Deficient; **WPA Schedules** (I, II, III, IV) as per Indian Wildlife (Protection) Act, 1972; **Residential Status**: R: Resident/ Resident Breeding, MB: Monsoon Breeding Migrant, MM: Monsoon Migrant, W: Winter Migrant, PM: Passage Migrant, V: Vagrant and **Feeding guilds**: FN: Fruitnect, I: Invertebrate, OM: Omnivore, PS: PlantSeed and VFC: VertFishScav,* bird is probable escape from the captivity)

Probable first records for the district

1. Chestnut-headed starling *Sturnia malabarica*

This bird was sighted at Sultanpur village on 4 August 2016. We identified it from the bill with a yellow tip, pale head, orangish rump and belly (Ali and Ripley, 1987). Ganpule (2016) mentions it as an uncommon resident bird with scattered records all over Gujarat. There are not any previous records from the study area.

2. Oriental pratincole *Glareola maldivarum*

On 13 August 2016, we noticed more than 100 pratincoles scattered in an open field near the sea at Dandi (Patel & Chaudhari, 2016). The flock consisted mainly of immature juveniles with 5 adults. We identified the adult bird with a white tip on the wing, darker secondary wing and narrow fringe. And the juvenile bird with a grey-brown plumage tone and lack of dark throat (Driessens & Svensson 2005). Although Oriental Pratincole is uncommon to rare residents and local breeding migrants, they are not mentioned in South Gujarat (Ganpule, 2016).

3. Slaty-breasted rail *Lewinia striata*

The bird was sighted and photographed by Dr. Sujit Patel in Sultanpur village on 14 July 2018 (pers. comm.). Afterward, we observed this bird in July-September 2018 and also reported the nesting for the first time in the South Gujarat region specifically in Navsari (Patel et al., 2020). Ali (1954-55) did not report this bird from Gujarat but Ganpule (2016) reported it as regular in South Gujarat and rare monsoon migrants in other parts.

4. Indian skimmer *Rynchops albigollis*

One individual Indian Skimmer was reported for the first time in the Navsari on 1 December 2020 with the flock of river terns (Patel, 2021). We observed this bird on 2nd and 3rd December 2020. About 4 individuals of Indian skimmers were spotted by Mehul Patel (MP) and Dipak Patel (DP) in November 2021. Afterward, we observed and photographed the birds in December 2021 for about 15 days in the same area. According to Ganpule (2016), it is an uncommon and rare migrant. Generally, it's seen in the late monsoon and winter months. It is frequently seen in Jamnagar and Nalsarvar with scattered records from Saurashtra (Ganpule, 2016).

5. Jack snipe *Lymnocyptes minimus*

Jack snipe was first sighted at Sultanpur wetland on 20 November 2020. Later on, they were seen at the nearby Kanera wetland up to December 2020 (Patel and Bhatt, 2021). We observed this bird on 29 November 2020 on the Sultanpur wetland. In Gujarat, Jack

snipe is shown to be an uncommon winter visitor to parts of Kachchh, Saurashtra, South Gujarat, and Central Gujarat (Grimmett et al., 2011). This species is common to uncommon winter visitors with sightings in many parts of the state and with chances of being overlooked (Ganpule, 2016). It's a very shy bird with very few photographic and sighting records from the Gujarat state and this could be an important sighting in decent numbers from the South Gujarat region.

6. Great bittern *Botaurus stellaris*

Great bittern was reported for the first time on 20 November 2020. Afterward, it was regularly observed up to 3 January 2021 (Patel and Bhatt, 2020). We observed it on 10 December 2020 on Kanera village wetland which has small grasses and *Typha sp.* habitat. Historic records of the Great Bittern were reported from North Gujarat by Ali (1954-1955) and Grimmett et al. (2011). The Great Bittern is stated to be a rare winter migrant to Gujarat, with sightings from Saurashtra, North, and Central Gujarat (Ganpule, 2016). Recent records of the species from Khambhat (Vora, 2018) and Vadodara (Shah, 2018) in Central Gujarat are known. However, there were no documented records of Great Bittern from South Gujarat before these sightings.

7. Mallard *Anas platyrhynchos*

Mallard was reported by DP on 28 November 2020 in the Amalsad (https://www.birdsofgujarat.co.in/bird_detail.php?id=17553). Mallard is one of the uncommon winter visitors and rare in South Gujarat (Ali, 1954-55 and Ganpule, 2016).

8. Moustached warbler *Acrocephalus melanopogon*

Bird was recorded by DP and Pravin Patel (PP) on 9 Dec 2018 at Amalsad Village, Navsari (Per. Comm.). We observed this bird in the *Typha sp.* grasses on 14 December 2018. It was identified by a combination of a dark cape in the head with a well-marked white eyebrow. Ganpule (2016) mentions it as rare winter visitor with records from Saurashtra, Kutch and Central Gujarat. Ganpule (2016) also mentioned chances of being overlooked in Gujarat. Therefore this sighting authenticates its presence in south Gujarat.

9. Water rail *Rallus aquaticus*

Water rail prefers marshy habitat and is difficult to sight due to its skulker behaviour. It was photographed by DP at Amalsad wetland on 9 November 2018 (pers. Comm.). It can be identified with barred flanks and red bill (Ali & Ripley, 1987). Ali 1954-55 did not report this bird in Gujarat but Ganpule (2016) shows that it is a rare winter visitor and recently sighted in some parts of South Gujarat.

10. White winged tern *Chlidonias leucopterus*

White-winged tern was sighted in Sultanpur wetland on 19 September 2018 and identified by its black underwing coverts and black belly with moulting breeding plumage (Patel et al., 2019). There are scattered records from Jamnagar, Nalsarovar Bird Sanctuary, Porbandar, Rajkot, and Kutch and it is a passage migrant/ winter visitor of Gujarat (Ganpule, 2016).

Noteworthy rare/uncommon species

1. Curlew sandpiper *Calidris ferruginea*

On 9 September 2018, we recorded about 5 individuals of curlew sandpiper at Sultanpur wetland. The birds were seen for three days. It is a common winter visitor in coastal areas majorly common in Jamnagar, Kutch, and Saurashtra (Ganpule 2016). It is relatively rare in the Southern part.

2. Indian grey hornbill *Ocyrceros birostris*

This bird is common in the forest area of South Gujarat but not common in the Western Navsari area. This bird is recorded by Surendra Gohil (pers. comm.) in 2019 and since then we have been observing this bird regularly in January month for the last 5 years in the Navsari Agricultural University. Ganpule (2016) describes it as uncommon to a rare resident in central and south Gujarat forests.

3. Malabar lark *Galerida malabarica*

We sighted Malabar lark in Sultanpur, Dandi and Machhiwad area in Navsari. We identified the bird with rusty brown color, heavily streaked upperpart, paler under part and strong streaks that reaches to the breast (Ali & Ripley, 1987). Ganpule (2016) states it as a rare and uncommon resident in South Gujarat. Ali (1954-55) reported it at Salher fort (then in Navsari dist.) which is near to the present study area. Monga et al. (1984) reported the breeding of Malabar larks in the Rajpipla. Narve et al. (1997) have recorded

it from Shoolpaneshwar Wildlife Sanctuary. Patel and Bhatt (2017) mentioned the sightings from Sultanpur village of Navsari District in late August 2016 and it seems relatively common in South Gujarat parts like Ankleshwar and Hansot Taluka of Bharuch District in South Gujarat.

4. Asian Pied starling *Gracupica contra*

Asian pied starling is a rare/vagrant and has very isolated records from Gujarat (Ganpule, 2016). This bird was first reported and photographed by DP on 20 December 2020 in the Amalsad area of Navsari District (pers. comm.) and later on, at the end of December reported in Abrama village by one of us.

5. Malabar starling *Sturnia blythii*

About 15-20 Malabar starlings were first spotted at the wetland of Sultanpur by Patel & Patel (2021). It is identified by its bright white head and deep orange-red underparts. Parasharya et al. (2002) reported sightings of the Malabar Starling in different parts of Gujarat and also mentioned breeding in Gujarat. Patel (2002) reported 75-80 individuals of Malabar starling from Valsad which is the largest reported number near the study area. Ganpule (2016) states its scattered sighting and breeding record from Gujarat.

6. Red-crested pochard *Netta rufina*

It was reported in Devsar lake which is a freshwater lake at Bilimora on 15 March 2017 by DP. In January 2019 again it was reported by DP and those birds were seen for several days at the same location (pers. comm.). Red-crested Pochard is known to occur in wetlands of Central and North Gujarat while it is rare in Saurashtra and South Gujarat (Ganpule 2016).

7. White-rumped munia *Lonchura striata*

White-rumped munia is a resident bird in the Dangs Forest and it is an uncommon resident in South Gujarat (Ganpule, 2016). On 6 January 2019, about 15 birds were observed and photographed at Devsar lake near Bilimora (Patel, 2019).

8. Eurasian Hobby *Falco subbuteo*

It is a small widespread autumn passage migrant in Africa and South-East Asia (Rasmussen & Anderton 2012). Ali (1955) notes in Kutch and remarked that it was not seen in the plains of Gujarat. Dharmakumarsinhji (1955) reported that it is a winter migrant and mentioned it migrates south into most parts of India and Saurashtra. Grimmett et al. (2011) and Kazmierczak (2000) show that it is a winter visitor to Gujarat. Naorji (2006) describes it as a winter migrant to Gujarat. The bird was reported in South Gujarat in October 2013 (Bhatt et al. 2015). We observed this bird in 2019 (2 individuals) and 2021 (3 individuals) in months of October and November in Aat-Dandi Road, Sultanpur wetland, and Ero-Machhivad road in the study area.

Noteworthy vagrant sightings:

1. Amur Falcon *Falco amurensis*

It migrates through India and throughout the Arabian sea to Southern Africa which is the longest sea-crossing by any raptor around 2000 km. We sighted this bird in the Macchivad area in Navsari on 12th November 2017 (Patel et al., 2018). This bird is a rare passage migrate to Velavadar, Little Rann of Kutch (LRK), Greater Rann of Kutch (GRK), Gir National Park (GNP), and Dangs (Ganpule, 2016) and have very few previous records from the southern region (Joshi 2008 and Jat 2010).

2. Black-capped kingfisher *Halcyon pileata*

Ali (1954-1955) has collected only one specimen of Black-capped kingfisher from Sakalpatal of Surat-Dang forests. Rank and Parsasharya (2004) mentions Black-capped kingfishers in different parts of Gujarat and a few records from Surat and Dang. Ganpule (2016) stated it as uncommon to rare resident and local migrant with sightings from South Gujarat and isolated records from Kutch and Saurashtra. We recorded this bird in March 2014-2015 for two years in Sultanpur wetland.

3. Egyptian vulture *Neophron percnopterus*

It is common all over in Gujarat as per Ali (1954-55) and Ganpule (2016) but no other specific record has been noted in the Navsari area. It was sighted only once on 11 November 2017 in Sultanpur wetland, Navsari for a few minutes. (Patel and Patel, 2018). As per senior birdwatchers Rajendra Desai and Akshay Desai, it has been observed in the study area after 7-8 years and it is rare in the district.

4. Indian thick-knee *Burhinus indicus*

During transect on 5 July 2020 we observed and photographed this bird at Aat-Dandi Road on one occasion only. Ganpule (2016) describes a common resident in Gujarat but there are not any previous mentions in the Navsari district.

5. Indian shaheen falcon *Falco peregrinus peregrinator*

Indian shaheen falcon was reported by Rajendra Desai and Minal Patel only once on 10th November 2017 at Sultanpur Village, Navsari. This is a subspecies of Peregrine Falcon (*Falco peregrinus*) the adult bird can be identified with deep rufous colour on the under part and hooded appearance with a small cheek patch and dorsally dark grey or blackish (White et al. 2013).

6. Spotted flycatcher *Muscicapa striata*

Spotted Flycatcher is an autumn passage migrant bird mainly in Kachchh and Saurashtra. It is also reported from Amreli and Dwarka. (Ali, 1954-55, Grimmett et al. 2011 and Ganpule 2016). In South Gujarat, it is sighted only once from Surat on 2nd October 2016 (Per. Comm.). In our study area, it was first recorded on 21st September 2018 in Aat-Dandi Road, Navsari.

7. Striolated bunting *Emberiza striolata*

Striolated bunting is a resident bird to Saurashtra and Kutch but not mentioned in South Gujarat (Ali, 1954-55 and Ganpule, 2016). We reported this bird in the Sultanpur area on 21 September 2018 for the first time. We identified it with its brown speckling crown and breast (Ali and Ripley, 1987) and it's a rare bird in the Navsari area as well as in South Gujarat.

8. Common starling *Sturnus vulgaris*

On the 5 November 2019 we spotted one individual of the common starling in Sultanpur wetland with a group of Rosy Starling. Ganpule (2016) stated that it is an uncommon winter visitor and sighted in Jamnagar, GNP, GRK, LRK, and Thol bird sanctuary.

9. Blue rock thrush *Monticola solitarius*

As per Ali 1954-55 it is a winter visitor all over Gujarat including Surat-Dangs. Grimmett et al. (2011) show the distribution of Blue Rock Thrush all over the state and Ganpule (2016) reported that this bird is an uncommon winter visitor. This bird was recorded on 3 September 2018 in the Partapore area and its identification was confirmed with photographs. It was observed for two days so speculated to be a passage migrant (Desai, 2020).

10. Eastern Imperial Eagle *Aquila heliaca*

The Eastern Imperial Eagle is quite common in LRK, GRK (Ali 1954-55), and has scattered records from all over the state (Ganpule, 2016). This bird was sighted by Rajendra Desai in the month of December 2020 on Aat to dandi road (social media).

Noteworthy species with morphological aberration:

We observed some species with variation in their plumage colour. We identified the colour aberration as leucism following Van Grouw (2013).

1. Red-vented Bulbul: While doing a regular survey on the Dandi road Minal Patel observed one bulbul-like bird with unusual black and white colour. After close observation, it was identified as a leucistic individual of Red-vented Bulbul.
2. Baya weaver: On 27 October 2017 in Aat-Dandi Road the baya weaver with colour aberration was reported by Kapdi et al. (2018) during the transect.
3. Common coot: On 18 February 2018 DP was on a visit to Amalsad wetland and noticed different coloured common coot and after closer examination, it was identified as leucistic individual.

4. DISCUSSION

The study encompassed the checklist of species observed over a 10 years period and some species records from literature. Whilst the protected area of Navsari supports considerable diversity of flora and fauna, this study focuses on unprotected habitats of the Navsari and turns out as an important area for avifaunal diversity. The study area represents about 45% of bird species recorded in Gujarat. About 37% of recorded species are migratory species, including winter, summer, monsoon, and passage migrants. This points out the importance of the study area as a migratory ground. One of the major habitats of the present study is freshwater and saltwater wetlands.

Gujarat has the highest cover of wetland area in the country (National Wetland Atlas-Gujarat 2010). The largest wetland cover in the country and its position on the Central-Asian flyway make Gujarat an abode for migratory birds. 10.8% of the Navsari district's geographical area is covered by wetlands, which could provide diverse resources to aquatic birds. Mallard, Red-crested Pochard and Indian Skimmer are rare winter visitors reported in the study area. Great Bittern and Moustached Warbler are rare winter visitors in the study area which prefers *Typha sp.* habitat. We reported nesting records of rare monsoon migrant, Slaty-breasted Rail from the study area (Patel et al. 2020). The study site supports nesting colonies of Asian Openbill, Painted Stork, Cattle Egret, Great Egret, and Black-crowned Night-Heron. In Sultanpur wetland and some agricultural fields, the Sarus Crane, which is one of the globally threatened bird species (BirdLife International 2022) (IUCN 2022), congregate during the pre-breeding (pre-monsoon) and post-breeding (winter) periods. The agriculture field is used as a nesting site by them when it becomes temporarily inundated in water during the monsoon and it also facilitates food resources like rodents, frogs, insects, lizards, and small birds (Mukherjee, 2006). Agriculture fields are also used for roosting by Painted Snipes, Common Snipes, and duck species like Lesser Whistling Duck, Knob-billed Duck, Indian Spot-Billed Duck, Greylag Goose, Northern shoveler, etc. White faced whistling duck *Dendrocygna Viduata* was observed in the area but it is not included in the checklist as it is speculated to be an escapee from the private collection. (Desai, 2020).

One of the study sites of the present study 'Nani Kakrad' has been identified as a wetland of national importance under a National Wetland Conservation Program (NWCP). This emphasises the conservation importance of the study area and adheres to it in order to monitor and conserve the area's diversity. Despite the study area being identified as a wetland of national importance, attempts have not been made for the conservation and management of wetland as suggested by the Wetlands (Conservation and Management) Rules 2010 under NWCP. As the study site is neglected for any conservation and management in addition to that, the study site faces various human-induced threats. The major threat for the study area is the conversion of coastal wetland mainly for commercial prawn culture farms. The practices followed by fishermen for prawn culturing, empty the water from wetland areas. As a result, most of the wetlands dry up during the migratory period and couldn't provide resources to avifauna. The conversion of wetlands also poses a threat of habitat fragmentation in long run. Besides the threats from wetland conversion and fragmentation, the study area faces risks like invasive plant species and the use of excessive pesticides and fertiliser in the agroecosystems. Most of the wetlands are invaded with Jal kumbhi *Pontederia crassipes*. As a consequence of various threats, Common Shelduck (Patel, 2003), Black-necked Stork, Long-billed Vulture (Vashi, 2003), Red-headed Vulture, Egyptian vulture, Black-Capped Kingfisher and Great White Pelicans were regular winter visitors in the study area but recently they are not reported. The species like Red Avadavat, Lesser Flamingo, White Stork, Demoiselle Crane, Bar-headed Goose, and Eurasian Wryneck are being sighted more rarely than in earlier decades (Pers. and senior birders obs.). The abundance of birds visiting has also been decreasing throughout the years. Thousands of Flamingos, Common Cranes, and Pelicans have been recorded to visit the study area in the last decade. Among which Common Cranes are regular visitors but numbers of other species like Pelicans and Lesser Flamingos have decreased to negligible. Aside from the persistent threat in the study area, the threat posed by power lines has been shown to cause mortality of birds elsewhere (Tere and Parasharya, 2011). This can be recognised as a threat to some extant in the study area too.

It has been observed that the conservation of the study area is hindered by some socio-political issues. Therefore, sensitization about the importance of the study area among locals could help conserve the biodiversity of the study area. Mandates proposed under NWCP encourage research study for the wetlands of national importance, but that would be possible only after the formation of a steering committee for the wetlands by the state government. Despite the increasing number of threats, the study area harbours about 45% of bird species recorded in Gujarat. This highlights the importance of study sites for migratory and resident bird species. The study presents a preliminary checklist of avifaunal diversity of previously unexplored unprotected areas of Navsari district. Observational field studies like this potentially provide the baseline data for ecological questions pertaining to the effects of habitat modification and human influence apart from understanding the basic ecology of individual species or communities.

Author contribution:

All authors carried out field surveys and did preliminary analysis. MP and PK wrote first version of manuscript. MP and ZP finalised the manuscript.

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Dedication

To late Dr Bhavbhuti Parasharya, Ornithologist of Gujarat, India.

Ethical approval

Diversity and conservation status of avifauna in western Navsari, South Gujarat was observed in the study. The ethical guidelines for plants & plant materials are followed in the study for sample collection & identification.

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Conflicts of interests

The authors declare that there are no conflicts of interests.

Data and materials availability

All data associated with this study are present in the paper.

REFERENCES AND NOTES

1. Ali, S. & Ripley, S. D. Compact handbook of the birds of India and Pakistan. Delhi: Oxford University Press. 1987
2. Ali, S. The birds of Gujarat I and II. JBNHS 52, 1954-1956: 374-458, 735-802.
3. Bhatt, N., Ganpule, P., & Solanki, J. Status of Eurasian Hobby in Gujarat. Flamingo, 2015: 13: 3-6.
4. Bird Life International, Species factsheet: *Grus antigone*, 2022.
5. Borad, C. K., Mukherjee, A., & Parasharya, B. M. Conservation of the avian biodiversity in paddy (*Oryza sativa*) crop agroecosystem. Indian Journal of Agricultural Sciences, 2022: 70: 378-81.
6. Borad, C. K., Mukherjee, A., & Parasharya, B. M. Damage potential of Indian Sarus Crane in paddy crop agroecosystem in Kheda district Gujarat, India. Agriculture, Ecosystems and Environment, 2001: 86: 211-15.
7. Desai, I. V., Suresh, B., & Pilo, B. Birds of Shoolpaneshwar Wildlife Sanctuary. Pavo. 1993: 31: 55-72.
8. Desai, R. Blue Rock Thrush *Monticola solitarius* near Navsari. Gujarat. Flamingo, 2020: 18: 30.
9. Desai, R. Sighting of White-faced Whistling Duck *Dendrocygna viduata* near Navsari. Flamingo, 2020: 18: 10.
10. Dharmakumarsinhji, R. S. Birds of Saurashtra, India: With additional notes on the birds of Kutch and Gujarat. 1st ed. Bhavnagar, Saurashtra: Published by the author, 1955: 561.
11. Driessens, G., & Svensson, L. Identification of Collared and Oriental Pratincole- a critical review of characters. Dutch Birding, 2005: 27: 1-35.
12. Egwumah FA, Egwumah PO, Edet DI. Paramount roles of wild birds as bioindicators of contamination. Int J Avian & Wildlife Biol. 2017: 2(6): 00041.
13. Ganpule, P. A checklist of the birds of Gujarat. Bird Conservation Society, Gujarat. Ahmedabad, 2020.
14. Ganpule, P. First update to the Gujarat checklist: December 2017. Flamingo, 2017: 15: 17-20.
15. Ganpule, P. Second update to the Gujarat checklist: March 2020. Flamingo, 2020: 18: 11-20.
16. Ganpule, P. The Birds of Gujarat: Status and Distribution. Flamingo, 2016: 8: 2-40.
17. Ganpule, P. Third update to the Gujarat checklist: December 2021. Flamingo, 2021: 4: 3-8.
18. Grimmett, R. Inskipp, C. and Inskipp, T. Birds of the Indian Subcontinent. 2nd ed. Oxford University Press & Christopher Helm. London, 2011.
19. Jambu, N. & Patel, K. G. Birds of Surat-Dangs: a consolidated checklist of 75 years (1944-2020) with special emphasis on noteworthy bird records and bird hotspots from northern Western Ghats of Gujarat, India. Journal of Threatened Taxa, 2021: 13: 18752-18780.
20. Jat, M. Amur Falcon near Valsad. Flamingo, 2010: 7: 12.
21. Jha PK. Diversity and Status of avifauna from Balmiki Ashram to Temple Tiger in Chitwan National Park, Nepal. Species, 2021, 22(70), 175-186
22. Joshi, J. Sighting of Amur falcon near Kalibel, Dang. Flamingo, 2008: 6: 2.
23. Kapdi, P., Desai, J. and Tandel, N. Colour aberrant Baya Weaver near Navsari. Flamingo, 2018: 16: 24.
24. Kazmierczak, K. A Field Guide to the Birds of India, Sri Lanka, Pakistan, Nepal, Bhutan, Bangladesh and the Maldives. 1st ed. London: Pica Press / Christopher Helm, 2000.
25. Monga, S. G. & Naoroji, R. K. Birds of the Rajpipla forests- South Gujarat. With notes on nests found and breeding recorded and some new observations. JBNHS, 1984: 80: 575-612.

26. Mukherjee, A. The effect of irrigated agriculture on bird populations on the Mahi Right Bank Canal System, India. *Acta Zoologica Sinica*, 2006: 52: 561–563.
27. Naoroji, R. *Birds of Prey of the Indian Subcontinent*. New Delhi. Om Books International. New Delhi, 2006.
28. Narve, D. S., Patel, C. D., & Pandya, N. P. Avifaunal diversity in Shoolpaneshwar Sanctuary. *Tigerpaper*, 1997: 24: 17–22.
29. Parasharya, B. M., Borad, C. K. & Rank, D. N. A checklist of the birds of Gujarat. 1st ed. Gujarat: Bird Conservation Society, 2004.
30. Parasharya, B. M., Varu, S. N., Borad, C. K. & Mukherjee, A. *Sturnus malabaricus blythii* in Gujarat state. *JBNHS*, 2002: 99: 531–532.
31. Patel J. H. and Bhatt, M. Malabar Lark in South Gujarat. *Flamingo*, 2017: 15: 11–12.
32. Patel, M. and Chaudhari, K. Oriental Pratincole in Navsari District. *Flamingo*, 2016: 14: 21.
33. Patel, M. and Patel, D. Blyth's Starling *Sturnia blythii* in South Gujarat. *Flamingo*, 2021: 19: 24.
34. Patel, M. and Patel, D. Egyptian Vulture in Navsari. *Flamingo*, 2018: 16: 23.
35. Patel, M. H. Article in Nav Gujarat Samay. 7th February, 2021
36. Patel, M. Indian Skimmer *Rynchops albigollis* in Navsari. *Flamingo*, 2021: 19: 26.
37. Patel, M. White-rumped Munia *Lonchura striata* near Bilimora, Navsari District. *Flamingo*, 2019: 17: 21.
38. Patel, M., Kapdi, P. and Tandel, N. Amur Falcon in Navsari. *Flamingo*, 2018: 16: 21.
39. Patel, M., Kapdi, P; Tandel, N and Desai, J. Nest of Slaty-breasted Rail *Lewinia striata* in Navsari, Gujarat. *Indian Birds*, 2020: 16: 127–128.
40. Patel, P and Bhatt, A. Sighting of Jack Snipe *Lymnocyptes minimus* near Navsari. *Flamingo*, 2021: 4: 12.
41. Patel, P. C., Patel, D. and Dey, A. White winged tern *Chlidonias leucopterus* near Navsari. *Flamingo*, 2019: 17: 23.
42. Patel, P. C.; Bhatt, A. N. and Patel, D. (2020). Sightings of Great Bittern *Botaurus stellaris* near Amalsad, South Gujarat. *Flamingo*, 2020: 18: 7–8.
43. Patel, P. *Sturnus malabaricus blythii* in Gujarat state. *JBNHS*, 2002: 99: 531
44. Patel, P. Uncommon sighting of Common Shelduck (*Tadorna tadorna*) in Dandi, Dist. Navsari. *Vihang*, 2003: 6: 11.
45. Pittie A. A bibliography of ornithology in Gujarat, India: 1758–2010. *Indian Birds*. 2010: 6: 107–36.
46. Praveen J., R. Jayapal & A. Pittie. A checklist of the birds of India. *Indian Birds*, 2016: 11: 113–72.
47. Rank, D. N. and Parasharya, B. M. Status of Black Capped Kingfisher in Gujarat. *Flamingo*, 2004: 2: 2–4.
48. Rasmussen, P. C. & Anderton, J. C. *Birds of South Asia: the Ripley Guide*. 2nd ed. Washington, D.C. and Barcelona: Smithsonian Institution and Lynx Edicions. 2 vols, 2012.
49. Sekercioglu, Çagan H., Daniel G. Wenny, and Christopher J. Whelan. *Why Birds Matter: Avian Ecological Function and Ecosystem Services*. University of Chicago Press, 2016.
50. Shah, D. Sightings of Great Bittern in central Gujarat: Vadodara. *Flamingo*, 2018: 16: 22.
51. Shivraj Kumar, Y. S. The Moustached Sedge Warbler, [*Luscinola melanopogon* (Temminck)] and the Yellow Bittern, [*Ixobrychus sinensis* (Gmelin)]: Additions to the birds of Kutch. *JBNHS*, 1961: 58: 513.
52. Shull, E. M. Birds from the Surat Dangs (Gujarat State). *NLBW*, 1962a: 2: 8–10.
53. Shull, E. M. Birdwatching in the Dangs. *NLBW*, 1967: 7: 1–3.
54. Shull, E. M. More bird records from the Surat Dangs (Gujarat State). *NLBW*, 1964: 4: 4–6.
55. Shull, E. M. Supplementary notes on 'The birds of Gujarat' from birds collected in the Surat Dangs. *JBNHS*, 1962b: 59: 658–60.
56. Tere, A. and Parasharya, B. 2011. Flamingo mortality due to collision with high tension electric wires in Gujarat, India. *Journal of Threatened Taxa*, 2011: 3: 2192–2201.
57. Trivedi, P. and Soni, V. C. Significant bird records and local extinctions in Purna and Ratanmahal Wildlife Sanctuaries, Gujarat, India. *Forktail*, 2006: 22: 39–48.
58. Van Grouw, H. What colour is that bird? The cause and recognition of common colour aberrations in birds. *British Birds*, 2013: 106: 17–29
59. Vasi, J. Vultures and Sarus near Navsari. *Flamingo*, 2003: 1: 3.
60. Vora, U. Sightings of Great Bittern in central Gujarat: Khambhat Taluka. *Flamingo*, 2018: 16: 22.
61. White, C. M., Cade, T. M. and Enderson, J. M. *Peregrine Falcons of the World*. 1st ed. Lynx Edicions. Barcelona, 2013.
62. Wilman, H., Belmaker, J., Simpson, J., de la Rosa, C., Rivadeneira, M. M. and Jetz, W. Elton Traits 1.0: Species-level foraging attributes of the world's birds and mammals: *Ecological Archives* E095–178. *Ecology*, 2014: 95: 2027–2027.
63. Worah, S. The ecology and management of a fragmented forest in South Gujarat, India: the Dangs. PhD Thesis, University of Poona, Pune, India, 1991.
64. Zhang, Wei wei, and Jian zhang Ma. Waterbirds as Bioindicators of Wetland Heavy Metal Pollution. *Proceedings of Environmental Sciences, 3rd International Conference on Environmental Science and Information Application Technology ESIAT*, 2011:10: 2769–74.